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A COMPARATIVE STUDY OF LIVE AND KILLED VACCINES IN EXPERIMENTAL TUBERCULOSIS

A PRELIMINARY NOTE [1]

By B. J. Olson, *Surgeon*, Karl Habel, *Surgeon*, and Willard R. Piggott, *Bacteriologist, United States Public Health Service*

The recent development of an apparatus for the ultraviolet irradiation of mass quantities of bacteria by Oppenheimer and Levinson (*1*) offered an opportunity for studies of ultraviolet light-killed vaccines in comparison with variously prepared vaccines, including BCG, in experimental tuberculosis. This report presents the results secured with vaccines from one virulent strain of human-type tubercle bacilli and with BCG.

STRAINS OF ORGANISMS

A strain of BCG, R. L. 173, obtained from the Bureau of the Laboratories, New York City Department of Health in September 1943, has been carried in this laboratory on an inspissated egg medium similar to that described by Frimodt-Möller [2] (*2*). The strain of virulent tubercle bacilli, 199–RB (*Mycobacterium tuberculosis hominis*), was isolated from a patient in Tennessee. This strain was carried on the same media as the BCG strain.

PREPARATION OF VACCINE

Cultures of the organisms were grown at 37° C. on freshly prepared egg slants and were harvested after 12 to 15 days of incubation. The growth was removed, weighed, and then ground for 3 hours in a ball mill to ensure the preparation of a uniform suspension. The concentration of the final suspension was adjusted to 1 mg. per cubic centimeter.

EXPOSURE TO ULTRAVIOLET LIGHT

The exposure time to ultraviolet light varied from 1.23 seconds to 1.70 seconds per organism. This exposure represents an excess of

[1] From the Division of Infectious Diseases, National Institute of Health.
[2] No malachite green was added.

that necessary to kill; for example, BCG was killed by as little as 0.06 second per organism. It was felt in these initial experiments that definite killing was the primary consideration, although it is suspected that such severe treatment is not conducive to the retention of maximum antigenicity. Proof that irradiated organisms were killed was demonstrated in two ways. Four-tenths of a cubic centimeter of the undiluted irradiated suspension was seeded on each of 10 tubes of the above-mentioned egg media. An additional 10 tubes were seeded with 0.2 cc. of the same suspension. A total of 6 cc. of the undiluted vaccine, therefore, was cultured. All cultures were observed for a minimum of 180 days before being discarded; in no case was growth observed. Each of seven guinea pigs was injected intraperitoneally with 5 cc. of irradiated vaccine. No evidence of tuberculosis was found at autopsy in these animals after at least 2 months of observation.

The live BCG vaccine employed was prepared on each day of vaccination in the same manner as described, but it was not irradiated.

Heat-killed vaccines of each strain were prepared by heating comparable suspensions at 80° C. for 1 hour.

The shortest period of storage of ultraviolet-irradiated vaccine before being used in a test was 112 days at 10° C.

METHOD OF VACCINATION

Vaccinated animals: Irradiated vaccines.—Group A, 59 guinea pigs. Each guinea pig received 5 cc. of irradiated vaccine, 199–RB, intraperitoneally at weekly intervals (March 13, 20, and 27, 1946).

Vaccinated animals: Live vaccines.—Group B, 48 guinea pigs; each received 5 cc. of live BCG vaccine on the same dates as Group A.

Group C, 59 guinea pigs; each received only a single dose of 5 cc. of live BCG vaccine intraperitoneally on March 20, 1946.

Control group.—Group D and Group E; each group of 60 normal, nonvaccinated guinea pigs was given the same challenge dose of virulent tubercle bacilli as the vaccinated groups.

Challenge with virulent tubercle bacilli.—On April 17, 1946, each guinea pig in the above groups was challenged with 1 mg. of a suspension of a 15-day-old culture (199–RB) intraperitoneally. All the guinea pigs received the same treatment and were kept in the same room, five guinea pigs per cage. No animal was sacrificed, and all were observed up to time of death and autopsied.

RESULTS

Results are summarized in the accompanying chart. This chart gives the death curve (accumulated mortality by days since challenge)

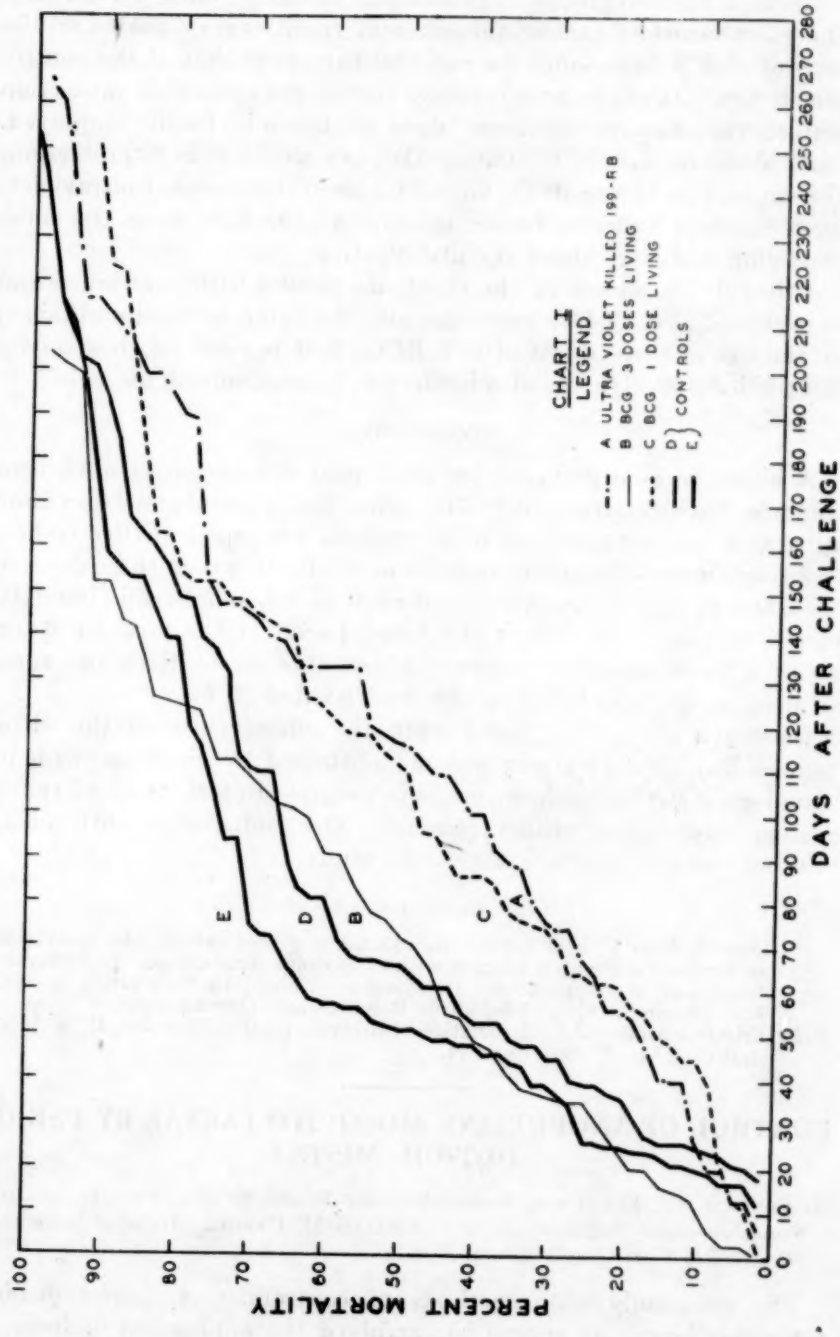
CHART I
LEGEND
A ULTRA VIOLET KILLED 199-RB
B BCG 3 DOSES LIVING
C BCG 1 DOSE LIVING
D CONTROLS
E
PERCENT MORTALITY
DAYS AFTER CHALLENGE
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280
100 90 80 70 60 50 40 30 20 10 0

for each of the five groups of guinea pigs to date (January 16, 1947). The effectiveness of each of the different vaccines is evaluated on the basis of ability to prolong the survival time over that of the control guinea pigs. It will be noted that no vaccine gave complete protection against the massive challenge dose of tubercle bacilli employed. Three doses of live BCG (Group B) gave slight, if any, protection. The single dose of live BCG (Group C) and three doses of ultraviolet-killed virulent tubercle bacilli (Group A, 199–RB) gave the most protection and were about equally effective.

Although not shown on the chart, the results with heat-killed and ultraviolet-killed BCG were essentially the same as results obtained by the use of three doses of live BCG, that is, relatively ineffective. Heat-killed 199–RB was also ineffective in immunizing animals.

CONCLUSION

A killed vaccine prepared by ultraviolet irradiation of a virulent tubercle bacilli (strain 199–RB) with the Oppenheimer-Levinson apparatus and administered in three doses was equal in effectiveness to a single dose of live BCG and was more effective than three doses of the latter against a massive dose of virulent tubercle bacilli (199–RB) in guinea pigs. The ultraviolet-killed bacilli of the virulent strain made a more effective vaccine against this strain than the same virulent strain heat-killed or ultraviolet-killed BCG.

Inasmuch as in this initial work the effectiveness of the ultraviolet-killed virulent strain was demonstrated by challenge with its homologous strain, further work is in progress to test its effectiveness against heterologous virulent strains. The comparative antigenicity of other virulent strains is also under study.

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CONTROL OF ANOPHELINE MOSQUITO LARVAE BY USE OF DDT-OIL MISTS [1]

By Frederick F. Ferguson, *Senior Assistant Sanitarian (R)*, Earl H. Arnold, *Senior Assistant Engineer (R)*, and William M. Upholt, *Assistant Sanitarian (R)*, *United States Public Health Service*

The commonly used methods of controlling *Anopheles quadrimaculatus* larvae by sprays has involved the application of from 15

[1] From Communicable Disease Center, Technical Development Division (Savannah, Ga.), States Relations Division.

to 20 gallons of larvicide per acre of water surface. Among the first adaptations of DDT to the control of mosquito larvae was the application of the same total quantity of material, consisting of a quick-breaking DDT-oil-water emulsion using the same types of equipment and methods of treatment as formerly. Although this method of treatment is highly effective (*1*), it is also relatively toxic to aquatic wildlife, and no manpower savings are realized with its use. Since only minute quantities of DDT-fuel-oil solutions are required to kill anopheline larvae, equipment and techniques for uniformly distributing small dosages were developed (*2*). The present paper details the results of larvicidal tests made with various solutions and dosages of DDT in order to determine the most effective procedures for the hand distribution of oil mist sprays.

Experimental plots were selected from the variety of mosquito larval habitats found near Savannah, Ga. These were selected primarily from the standpoint of permanency, size, type of vegetative cover, and density of larval populations. Sampling was done by means of dippers, and for the most part, an attempt was made to determine the larval instars in the field. A majority of the studies entailed pretreatment sampling, with one-day, two-day, three-day, five-day, seven-day, ten-day, and fourteen-day posttreatment larval counts. Untreated check plots were used when possible, and studies on the larvicidal effects of the solvent alone were made. Gross observations were made on the condition of other aquatic organisms at each visit to an experimental plot.

No. 2 fuel oil was selected as a solvent, since former work (*1*, *3*, *4*, *5*, and *6*) had indicated it to be satisfactory with reference to its DDT dissolving capacity, cost, availability, and larviciding results obtained. The spreading properties of the solvent were enhanced by the addition of a small quantity (0.5 percent) of B-1956 [2] to the larviciding formula. Other commercially available materials, such as Emulphor AG, Oil Soluble,[3] may also be satisfactory as spreading agents. In general, the effectiveness of the DDT-oil mists was improved by the addition of spreading agents. Observations indicated that there is considerable variation in the spreading properties of the various fuel oils, some of which spread very poorly when applied to the water surface. The addition of small amounts of suitable spreading agents had the effect of improving the spreading properties and of minimizing the importance of the variation.

[2] B-1956 is made by Rohm and Haas Company, Philadelphia, Pa.
[3] Emulphor AG, Oil Soluble is made by General Dyestuffs Corp., New York, N. Y.

EQUIPMENT

The application of small total quantities of DDT larvicide with air-pressure sprayers fitted with mist nozzles may be considered to be merely an adaptation of airplane-dispersal methods to hand larviciding. The aforementioned DDT formula may be applied at the rate of one gallon per acre and be readily dispersed over the breeding area with the equipment to be described.

Agricultural sprayers of the air-pressure type were used in the study. These sprayers are fitted with a hand pump for developing pressure in the tank and vary in capacity from one and one-half to four gallons. The larger sprayer has the greater capacity and, when charged with a gallon of larvicide, requires considerably less frequent repumping in order to maintain the optimum operating pressure; the smaller sizes will be found convenient for use in areas where obstructions such as trees or other vegetation are present in the watered areas.

The sprayers are best fitted with pressure gages recording from 0 to 100 p. s. i., and with a three- to four-foot-long oil-resistant hose. A wand 2 to 3 feet in length is fitted with an atomizing nozzle of small capacity which produces a fine mist spray.[4] The nozzle used is of very simple construction. It has no moving parts, and is constructed of bronze, with the exception of a gauze screen in the body to prevent clogging. Since the screen openings are smaller than the flow passages, they are the only place which usually requires cleaning, although it may occasionally be necessary to clean flow passages and the orifice plate. Cleaning is easily accomplished by unscrewing the body from the base and disassembling the component parts. Since the internal parts can be fitted together only in the proper manner, correct reassembly is assured. The sprayer is operated at a pressure range of from 30 to 50 p. s. i., the average discharge over this range being approximately 3.0 gallons per hour. Determination of particle size by measuring droplet sizes on carbon-coated slides shows that the mist spray produces particles ranging from 70 to 220 microns. Tests performed showed the mass median diameter of droplets produced over a 30- to 40-foot swath to be in the range of 100 to 125 microns, the tests being made with a 2½-m. p. h. wind blowing. A shoulder strap on the sprayer permits the operator to carry the equipment with a minimum of discomfort. The wand is directed with one hand, the other remaining free.

[4] Nozzle 1H41 manufactured by the Marley Company, Inc., ¼LN 2.55 manufactured by the Spraying Systems Company, and Monarch 5 manufactured by the Monarch Manufacturing Works have been used experimentally, and found to be satisfactory.

OPERATIONS

In operation, the sprayer is usually charged with 1 gallon of the larvicide. This quantity has been found convenient since it will treat approximately an acre of breeding area, does not overload the operator, and with the larger volume of air does not require as frequent repumping. The sprayer is pumped to a pressure of 50 pounds and is not allowed to drop below a pressure of 30 pounds. The vaporous oil mist discharged by the nozzle is windborne for considerable distances. A swath width of 30 feet was selected since satisfactory results were obtained under most conditions encountered (i. e., winds up to 5 m. p. h.). With low wind velocities, recovery beyond 30 feet is low, while with increased wind velocities the effective swath width may be 40 or 50 feet. In treating watered areas, the operator moves at a slow pace (approximately 75 feet per minute) through the area, holding the nozzle at a height compatible with the particular wind velocity. While the mist is visible to some extent, both in the air and as it strikes the water surface, it is advisable to ignore it as a swath-measurement device. The oil film formed is very slight, thus little marker is present on the surface. Hence, it is desirable to mark swaths, or to so instruct the operator in the practice of mentally demarking them that with practice the swath width may be reasonably approximated. As described elsewhere (*2*), unskilled labor may be taught this type of larviciding within a very short period of time.

Mixing of the larvicide is very readily and simply done by adding 2½ pounds of technical DDT, and 1 quart of B–1956 to 50 gallons of clean No. 2 fuel oil. The materials may be introduced through the bung of the oil drum, and agitated by tipping or rolling on the ground. The drum should be allowed to stand at least 24 hours before use, and should be agitated prior to withdrawing any larvicide for transporting to the field. Precautionary measures to avoid contamination of the larvicide with debris during mixing or handling should be observed, in order to eliminate unnecessary clogging of the nozzle in the field.

EXPERIMENTAL FIELD RESULTS

In the course of the studies performed, applications of DDT in fuel oil were made at the rate of 2, 1, and ½ gallons of solvent per acre. In each case, the amount of DDT varied so as to produce final applications ranging from 0.1 to 0.025 pounds of DDT per acre. Table 1 presents the results of applications of small quantities of DDT-oil larvicides applied with mist sprayers.

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TABLE 1.—*Mortality of anopheline larvae obtained with DDT-fuel oil-B-1956 solutions, applied with air-pressure hand sprayers, fitted with "atomizing" nozzles*

Gallons of No. 2 fuel oil per acre	Number of tests	DDT dosage per acre	Larval mortality (percent) and time after treatments (days)			
			1 day	2 days	3 days	5 days
2	5	0.1	86	95	.....	.....
2	3	.05	98	99	94	.....
1	17	.1	94	95	87	40
1	7	.05	88	94	93	66
1	2	.025	96	92	94	.....
½	9	.1	95	94	96	21
½	5	.05	93	87	96	22
½	2	.025	98	100	.....	.....

These data indicate a high initial kill of larvae with all designated dosages of DDT in the varying quantities of solvent. Reinfestation, as shown by an increase in first instar populations, was generally in evidence by the third day when favorable weather conditions exist. While the population continues to build up, 10 to 12 days may elapse before many fourth instar larvae are present. DDT was equally effective against all larval instars, but it seemed to have little effect on pupae.

Table 2 presents a comparison of the effectiveness of two types of spray distribution under otherwise comparable conditions. A knapsack sprayer was used to apply the larvicide at the rate of 15 gallons per acre. This type of application was used for the dispersal of various DDT formulas as previously reported (*1*), and proved to be an effective method of distribution, although no manpower savings were

TABLE 2.—*Mortality of anopheline larvae obtained with treatments at the rate of 15 gallons per acre as compared to mortalities obtained with treatments at the rate of 1 gallon per acre. In all cases the DDT application was at the rate of 0.1 pound per acre*

Material and rate	Larval mortality (percent) and time after treatments (days)		
	1 day	2 days	3 days
Emulsions:			
Commercial product with DDT:			
15 gal./acre	93	96	.....
1 gal./acre	92	.....	100
DDT-xylene-Triton X-100 [1]-water:			
15 gal./acre	100	100	.....
1 gal./acre	94	.....	97
Suspensions:			
DDT-ethyl-alcohol-water:			
15 gal./acre	99	99	.....
DDT-ethyl-alcohol-water:			
1 gal./acre	100	.....	100
Surface applications:			
Fuel oil-DDT-water:			
15 gal./acre	96	99	.....
Fuel oil-DDT:			
1 gal./acre	99	.....	100

[1] Triton X-100 is an emulsifier produced by the Rohm and Haas Company, Philadelphia, Pa.

realized. The treatments at the rate of 1 gallon per acre were made with the mist sprayers. As will be noted in the table, no significant difference in effectiveness was indicated. Since the same total quantity of DDT and solvent was used in each case, the distribution of the toxic principle was apparently equally effective.

The experimental application of larvicides at low rates with the mist sprayer has proved effective for applying DDT emulsion or solution formulas. A companion paper (*2*) presents the results of studies made on areas treated with DDT solutions applied with mist sprayers as compared to similar areas treated with DDT dusts and paris-green dusts. Data on man-hours requirements showed that the mist-spray applications required 1.7 man-hours per acre larvicided, as compared to 3.1 for paris green, and 3.7 for DDT dust. The cost of larvicide per acre according to late season prices was as follows: DDT-oil solution \$0.15–\$0.20, DDT dust \$0.36, and paris-green dust \$0.25, showing a substantial savings in material costs in favor of the DDT-oil applications. The mist-spray larvicide produced considerably better larval kills than did the dusts, when all instars were considered separately.

Parallel studies performed on the effect of DDT on fish and associated fish-food organisms (*7*) indicated that routine applications of DDT at the rate of 0.1 pound per acre may produce detrimental effects on the fish and that applications in the range of 0.05 pound per acre may generally be used with reasonable safety. Since mortalities of mosquito larvae obtained with DDT applications in the range of 0.05 pound per acre were not significantly different than those obtained with 0.1 pound, the lower application rate was selected as a recommendation for general operational use by Malaria Control in War Areas, the recommended formula being 0.625 percent DDT, and 0.5 percent B-1956, in No. 2 fuel oil, with an application of 1 gallon of solution per acre.

SUMMARY

1. Dispersions of mist sprays of DDT-fuel-oil solutions have been shown to be a practical adaptation of this insecticide to the control of *Anopheles quadrimaculatus* larvae.

2. Since the material is equally effective against all larval instars, an extension of the larviciding interval from 2 to 3 days may be expected over that in use with paris-green dusts.

3. For routine treatments throughout the season, treatment applications of no more than 0.05 pound DDT per acre are recommended where fish life is of importance.

4. Mist-spray DDT-oil larvicides may be distributed by means of light-weight air-pressure sprayers. This results in less labor fatigue, and in the more effective use of manpower.

5. On the basis of current prices, savings in material costs as well as labor can be anticipated by the substitution of DDT-oil mist sprays for other types of larvicides.

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THE INACTIVATION OF DDT USED IN ANOPHELINE MOSQUITO LARVICIDES [1]

By WILLIAM M. UPHOLT, *Assistant Sanitarian (R)* [2] *United States Public Health Service*

INTRODUCTION

One of the most outstanding characteristics of DDT used as an insecticide is its persistence. The residual effectiveness of DDT applied to certain wall surfaces for the control of adult mosquitoes is measured in terms of months (*1*). When used in artificial containers for the control of larvae of *Aedes aegypti* (L), DDT may remain effective for a period of months (*2*). On the other hand, when DDT is used for the control of anopheline larvae at dosages that are adequate for high initial mortality and reasonably safe to other aquatic forms of wildlife, no residual toxicity is evident 1 to 2 weeks after application. Efforts to extend the larviciding interval by increasing the dosage of DDT without killing fish, or by changing the type of application, have been unsuccessful (*3*). Even a rather small increase in the period of effectiveness of DDT as an anopheline larvicide would be most valuable, because it would permit fewer applications for control during the season, thus saving greatly on labor as well as

[1] From Communicable Disease Center, Technical Development Division (Savannah, Ga.), States Relations Division.

[2] The author wishes to express his appreciation to Mrs. C. F. Stierli, Junior Entomologist, for valuable aid in conducting the experiments described herein.

materials. Therefore, it seemed worthwhile to devote some effort to determining the factors in anopheline-breeding areas that inactivate the DDT, hoping that the results might suggest a method of overcoming these factors and thus of obtaining a longer residual effectiveness.

Preliminary studies (*3*) have indicated that the presence of mud containing at least some organic matter is an important factor in the inactivation of the DDT. By adding 100 gm. of bottom mud to 250 or 300 ml. of laboratory preparations containing 0.25 p. p. m. of DDT, the toxicity to insectary-reared, fourth-instar larvae of *A. quadrimaculatus* (Say) was reduced to 13-percent mortality in a 24-hour exposure period within 5 days after preparation, whereas similar preparations without the bottom mud were still killing 100 percent of the larvae added thereto 10 days and longer after preparation.

It is not to be assumed from this experiment that mud is entirely responsible for the inactivation of DDT in nature. Undoubtedly other factors also play a role. It has been shown (*3*) that the effectiveness of DDT as a larvicidal spray is restricted by the distribution of the solvent. This is to be expected, inasmuch as DDT does not dissolve in water in sufficient quantities to kill larvae of *A. quadrimaculatus*. As a result any factor, such as wind and wave action or the precipitation of a suspension, which reduces the distribution of the DDT, will doubtless reduce its effectiveness. That such factors are important can be shown by applying a drop of No. 2 fuel oil, containing 1.25-percent DDT, to the clean surface of water in a crystallizing dish. Under proper conditions, the oil spreads to form a uniform film covering the entire surface of the water, but after a short time breaks up into a number of lenses separated by apparently clean areas. These areas actually are covered by an invisible film, as indicated by the fact that an additional drop placed in one of these apparently clean areas fails to spread. If, now, a tube is placed down through one of these clear areas, care being taken to exclude all portions of lenses, larvae confined in such a tube are not killed, even though larvae allowed to swim free in the crystallizing dish are killed very rapidly. Similarly, if wind or wave action in the field were to drive all of the DDT preparation to one side of the pond, no residuum could be expected in those areas free of DDT.

That wind and wave action are not alone responsible for the loss of effectiveness in the field should be apparent from the fact that even when the DDT is applied as a tight emulsion or as a suspension prepared by diluting an alcoholic solution (95-percent ethyl alcohol) with water, breeding occurs within essentially the same period following treatment (*3*). In such cases precipitation of the DDT could

logically remove it from the surface of the pond where anopheline larvae feed. However, a similar quantity of DDT, dried onto a microscope slide and then placed in a beaker of water, showed high toxicity to insectary-reared larvae. Again, glassware that had contained a considerable amount of DDT was emptied out, dried, and thoroughly rinsed in tap water, after which it continued to show toxicity. However, bottom-feeding larvae, such as some of the culicines, can be found living in ponds treated with an alcoholic suspension of DDT about as soon as anopheline larvae.

There are probably other factors that tend to reduce the effectiveness of DDT even in the absence of mud. A suspension of 1 part DDT in 10 to 50 million parts of water will kill 100 percent of the larvae when it is freshly prepared, but such concentrations lose their effectiveness, even in the absence of mud, over a period of 1 to 2 weeks. It has been observed that there is a change in the slope of the time-mortality curve as such preparations age. Thus, a freshly prepared suspension of one part DDT in 10 million parts of water will kill 100 percent of a reasonably sized sample of larvae within several hours. During the second 24 hours, it may be even more rapid. After 4 or 5 days, the rate of mortality may be quite slow, and by the time a week has elapsed, a 48-hour exposure may fail to produce 100-percent mortality. Such a reduction in toxicity, as shown in figure 1, might conceivably be explained as due to volatilization or chemical decomposition. Little is known about the rate of volatilization of DDT in suspension, though dry DDT is

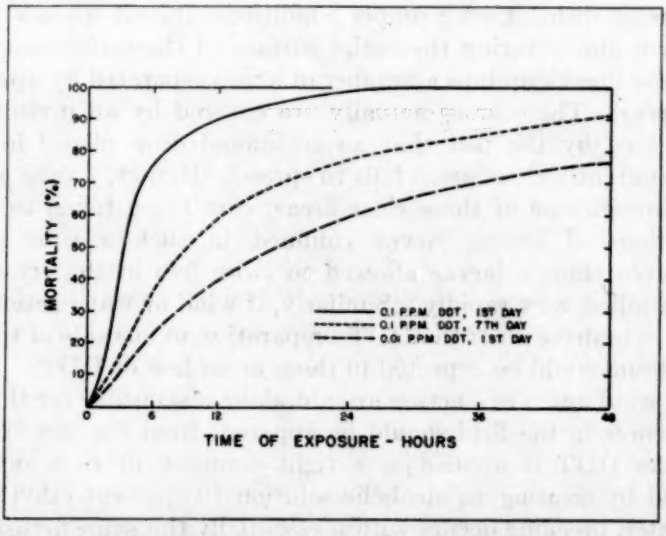

FIGURE 1.—Time-mortality curves showing the effect of aging on the speed of action of 0.1 p. p. m. DDT against third-instar larvae of *Anopheles quadrimaculatus* (Say)

extremely nonvolatile. Chemical methods of analysis now available are not sufficiently accurate, when working with such small quantities, to provide conclusive evidence on possible chemical decomposition. However, in view of what is known concerning the chemistry of DDT, it seems more reasonable to explain the reduction in toxicity as a result of a physical change associated, possibly, with the evaporation of the mutual solvent or with the agglomeration and precipitation of the suspended particles of DDT.

Without minimizing the importance of the physical factors already discussed, it is apparent that there are other factors associated with the presence of mud that are also of importance. Arnold et al. (*3*) provided preliminary evidence that organisms living in the bottom mud were not directly responsible for the inactivation of the DDT.

Further evidence has been obtained by autoclaving mud preparations just before adding the DDT and then using sterile technique in introducing the DDT, assuming the solution of DDT in 95-percent ethyl alcohol to be sterile. Three series of containers were so prepared, each containing 25 gm. (dry weight) of mud and 250 ml. of a 1-p. p. m. DDT suspension. Larvae were immediately added to the first series, and 1 week later a few larvae were able to survive in this preparation. Two weeks after preparation, less than 25 percent of the larvae were killed, and before the expiration of 3 weeks, no toxicity at all was apparent. At this time, larvae were added to the second series which had been held sterile and undisturbed since preparation. At the same time, each container of the third series, which had also been held sterile up to this time, was inoculated with 1 ml. of the supernatant water from the first series, which had lost its toxicity. This third series was then left undisturbed for another 3 weeks.

The second series, which had been held sterile and undisturbed for 3 weeks, was toxic when larvae were first added. However, on the second day several larvae survived, and by the fifth day there was no evidence of toxicity. Apparently, the greater portion of the DDT had been inactivated while being held undisturbed in a sterile condition. Probably a small quantity of DDT, possibly floating on the water surface, had produced toxicity when larvae were first added but had lost its toxicity rapidly when disturbed.

The third series, which had been inoculated with water from the first series, had developed such a growth over its surface after 3 additional weeks, that it was impossible to test it for toxicity.

It is entirely possible that some DDT is occluded by the bottom mud, by the aquatic biota, or by both. In at least one case, DDT was inactivated by a gelatinous preparation of montmorillonite, which fails to absorb DDT from alcohol. If simple occlusion were the im-

portant factor in the loss of toxicity in laboratory preparations, then at least some of the toxicity should be recoverable by stirring the mud in the presence of larvae. After repeated tests this phenomenon has failed to occur. However, after the organic content of a sample of mud was destroyed by heating to a constant weight in a muffle furnace, the inorganic residue failed to inactivate DDT. Clean inorganic sand and aquatic plants (i. e., *Elodea* and *Utricularia*) have failed to inactivate DDT in the absence of mud. Therefore, it is concluded that any occlusion which takes place is inadequate to explain the observed inactivation of DDT.

Adsorption of the DDT by certain constituents of the mud seems to be the most important factor. It can be shown that activated carbon ("Nuchar W")[3] can adsorb DDT not only from water suspension but also from alcoholic solution. Fifty milligrams of DDT dissolved in 50 ml. of 95-percent ethyl alcohol was held in contact with 10 gm. of the activated carbon for several days. When 0.1 ml. of the supernatant alcohol was added to 300 ml. of tap water in a 600-ml. beaker, the solution was found to be nontoxic to larvae. If the DDT had remained in solution in the alcohol (as it did in the absence of the activated carbon), the preparation should have contained about 0.3 p. p. m. of DDT and would have been highly toxic. Therefore, it was concluded that the activated carbon had adsorbed the DDT from the alcoholic solution. That the adsorption did not go to completion was shown by removing about 25 ml. of the alcohol by filtrating and evaporating to dryness. The deposit in this container was highly toxic to larvae when water was added. In similar tests, using 1 mg. of DDT in 50 ml. of alcohol in contact with 25 gm. of clean mineral sand, 1 ml. of the supernatant alcohol in 400 ml. of water produced a 100-percent mortality in 6 hours. Using Meadol[4], the mortality was only 20 percent in 6 hours. With various samples of dried mud, the 6-hour mortality varied from 60 to 100 percent.

In a similar experiment, using 1 mg. DDT, 100 ml. alcohol, and 10 or 50 gm. of adsorbent, 0.3 ml. of the alcohol-DDT without adsorbent killed 100 percent of the larvae of both *A. quadrimaculatus* and *A. aegypti* within 24 hours. When 10 gm. of activated carbon was used as an adsorbent, 10 percent of the *A. quadrimaculatus* larvae and none of the *A. aegypti* larvae were killed in 24 hours. Using 50 gm. of dried mud as an adsorbent, 0.3 ml. of supernatant alcohol killed all the larvae of *A. quadrimaculatus*, but only 20 percent of the *A. aegypti* larvae, in the 24-hour period. Using 50 gm. of fresh cow manure as the adsorbent, the results were the same as with mud.

[3] Nuchar W is a product of Industrial Chemical Sales Division, West Virginia Pulp & Paper Co., New York, N. Y.

[4] Meadol is a lignin product of Mead Co., Cincinnati, Ohio. It was kindly furnished by Dr. S. Gottlieb, U. S. Bureau of Plant Industry.

Further tests, using a variety of inorganic adsorbents such as activated alumina, a special activated fuller's earth, kaolinite, montmorillonite, and kieselguhr, failed to detect any adsorption of DDT from alcohol by any of these inorganic materials.

When these same materials were tested in water by making a slurry, adding about 350 ml. of water and 0.25 mg. of DDT dissolved in 0.25 ml. of alcohol to them, essentially similar results were obtained. Within 24 hours of the addition of DDT, the preparation containing 10 gm. of activated carbon showed no toxicity whatsoever. The lignin product, Meadol, and certain mud samples reduced the toxicity to 30 percent or less in 24 hours over a period of 5 to 10 days. Other mud samples required 2 to 3 weeks to produce a similar reduction in toxicity, and sand failed to reduce the toxicity noticeably over a period of 100 days.

To make sure that the observed removal of DDT from solution or from water was not actually a chemical decomposition, several samples that had lost their toxicity were analyzed for p, p'-DDT, using a modification of the Bent method. One such sample had had 1 mg. of DDT added to it, and a second had 2 mg. DDT. Both of these had lost their toxicity over a period of several months, and both had dried at least once and were finally analyzed about 9 months after preparation. A control test was run, using sand to which 1 mg. of DDT had been added. It was handled in the same manner as the other two samples and was still toxic after 9 months, killing all larvae within 24 hours. The recovery in these cases ranged from 20 to 30 percent of the amount of DDT originally added. Some of the DDT may have adhered to the glassware, which had a tenacious deposit of salts, in spite of washing with benzene. Some of the DDT may have undergone decomposition during the 9-month interval. But it is significant that the percentage recovery was essentially the same or slightly higher for the mud samples which had lost their toxicity than for the sand sample which was still highly toxic. Moreover, the recovery (0.23 mg. from one, and 0.56 mg. from the other, mud sample and 0.21 mg. from the sand) was sufficiently high in every case to have produced a high toxicity if freshly prepared.

As previously reported (*3*), a 100-gm. sample of mud has failed so far to adsorb more than 4 mg. of DDT over periods of time ranging up to 1 year. It is possible that this relatively small amount (4 parts in 100,000) does not represent saturation but is simply a limit imposed by time, for the adsorption of DDT from water by mud does take place very slowly as compared to more familiar adsorption phenomena. This may be due to the exceedingly slight solubility of DDT in water. If a suspension of DDT in water is filtered through a Seitz filter, the filtrate is nontoxic to insectary-reared, fourth-

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instar larvae of *A. quadrimaculatus*. Ignoring the possibility that an appreciable amount of DDT would be adsorbed on the inorganic filter during the process of filtration, this would indicate that the solubility of DDT in water at room temperature is appreciably less than 1 part in 100,000,000. In any case, when DDT is added to mud in small increments, allowing time for adsorption between additions, the rate of adsorption seems to remain fairly constant over several such additions. Agitation of the mud has little effect on this rate. Fifty-gram samples of dried mud, selected from some 21 different anopheline breeding areas scattered over 9 southeastern States, were placed in containers with 350 ml. of tap water. Alcohol, containing 0.25 mg. of DDT, was added to each, and larvae were added periodically to test the toxicity of the preparation. When toxicity was no longer apparent, another 0.25 mg. of DDT was added. This was continued until some samples had inactivated eight additions, or a total of 2.0 mg. of DDT. The last addition, in some cases, required no longer for inactivation than did the first addition. There was, however, a great difference between these samples from different sources in the length of time required for the adsorption. Some samples inactivated the 0.25 mg. of DDT in as little as 10 days, whereas other samples required as long as 90 days. Controls with sand lost their initial toxicity only after 100 days. It has been suggested that the glassware itself might adsorb DDT, thus explaining the reduction in effectiveness of the lower dosages in the absence of mud. Preliminary tests with glass wool have not substantiated this theory.

Through the courtesy of Dr. Sidney Gottlieb of the Division of Soils, Fertilizers, and Irrigation, of the United States Bureau of Plant Industry, seven of these samples were analyzed for the total organic carbon and for the moisture equivalent (which is considered a measure of soil colloids). The results, presented in table 1, indicate a marked correlation between the organic-carbon content of the sample and the mean amount of DDT adsorbed over a period of 10

TABLE 1.—*Mean amount of DDT adsorbed by 50 gm. of mud over a 10-month period as related to the organic-carbon content and the moisture equivalent of the mud*

Source of mud	Moisture equivalent	Percentage carbon	Amount of DDT adsorbed (in milligrams)
Fort Smith, Ark	21.3	0.92	0.75
Do	33.8	2.14	1.125
Blytheville, Ark	25.4	2.36	1.50
Norfolk, Va	20.6	3.34	1.00
Marked Tree, Ark	41.2	5.28	1.375
Montgomery, Ala	50.8	11.56	1.625
Elizabeth City, N. C	68.1	14.21	1.75

months. The moisture equivalent was also correlated with the number of additions of DDT, but the high correlation between moisture equivalent and organic carbon might suggest that both the moisture equivalent and the ability to adsorb DDT may be in some way dependent upon organic-carbon content. Certainly, when the results of these analyses are considered in the light of the results of tests with standard adsorbents, the conclusion that DDT is adsorbed principally if not entirely on organic materials appears justified.[5]

SUMMARY

Several factors may contribute to the relatively rapid loss in effectiveness of DDT applied in safe dosages for the control of anopheline mosquito larvae. Of these, the two most important appear to be redistribution of the DDT due to wind and wave action, and precipitation of suspended DDT and adsorption of DDT by some part of the bottom-mud complex. Adsorption is relatively slow on mud and appears to be on the organic components of the mud only, sandy soils with a minimum of organic material being rather poor adsorbents. It has been suggested that the use of competitive adsorbents might be of value, if it were possible to find a nontoxic substance that could be mixed with the DDT and applied with it, being adsorbed more readily than the DDT and thus preventing the adsorption of the DDT itself.

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ISOLATION OF AN UNIDENTIFIED SPIROCHETE FROM HEN'S EGGS AFTER INOCULATION WITH LIVER TISSUE FROM HENS[1]

By EDWARD A. STEINHAUS, *Associate Bacteriologist*,[2] and LYNDAHL E. HUGHES, *Scientific Aide, United States Public Health Service*

Observations made at the Rocky Mountain Laboratory in early 1944 indicated the occurrence in the vicinity of Hamilton, Mont., of a spirochete in the tissues of hens and/or hen's eggs. These observa-

[5] This problem was discussed with Dr. S. B. Hendricks of the U. S. Bureau of Plant Industry and he indicates that this conclusion might be expected on the basis of the molecular structure of DDT.

[1] Contribution from the Rocky Mountain Laboratory (Hamilton, Mont.) of the Division of Infectious Diseases of the National Institute of Health.

[2] Now at the University of California, Berkeley, Calif.

tions were made incidental to checking for the occurrence of disease in local flocks from which eggs were being obtained for laboratory use. This is the first known evidence of the occurrence of a spirochete in the tissues of hens in the United States.[3] Therefore, it has been felt desirable to report this finding, since it is of potential interest to laboratory workers using chick embryos for culturing various pathogens or for manufacturing vaccines.

On March 4, 1944, a white leghorn hen from flock G and a Rhode Island Red from flock W were killed and autopsied. No gross evidence of disease was noted. Liver tissue from each hen was homogenized in dextrose saline and was inoculated into the yolk of 5-day-old fertile eggs. Most of the embryos died on the eighth and tenth days, and, together with the embryonic membranes, were examined microscopically. In smears stained by the method of Macchiavello and by that of Giemsa, numerous bodies, some of them distinctly spiral shaped, were seen. They stained a bluish pink with Macchiavello's stain and a bluish purple with Giemsa's, and were gram negative.

Further observation of their morphology showed the organisms to be spirochetes. In smears of the tissues of infected eggs, the largest forms were approximately 0.4 to 0.6 by 8.0 to 10.0 microns and had from four to six undulations. The majority were much shorter, many of them being mere granules. All sizes were frequently observed in one field. In some preparations, the granules were present in large numbers, frequently appearing in the cytoplasm of the cells of the yolk sac. No granules were observed in the tissues of eggs not containing spirochetes.

On March 15, a white leghorn hen from a third flock (flock D) was similarly examined. The findings were essentially the same as those just described. The strain isolated from flock D was carried through 13 passages in 5-day-old fertile eggs, the incubation period ranging from 4 to 7 days.

Six eggs were used for each of the three isolations. Seven of the eighteen embryos died before the end of the second day; their tissues were not examined. Spirochetes were found in all of the 11 eggs from which smears were made.

Three mature hens were inoculated both intramuscularly and intraperitoneally with a yolk-sac suspension of the strain from flock D, but none of the birds showed any symptoms over a period of one month. No attempt was made to recover the strain from these inoculated hens. The spirochete was apparently not pathogenic for guinea pigs or white mice. Specific identification of the spirochete

[3] Subsequent to these observations, spirochetal infection was observed in a flock of adult turkeys in California. The findings have recently been reported by Hoffman, Jackson, and Rucker: J. Am. Vet. Med. Assoc., 108: 329–32 (May 1946). Harris, M. B. K. (Am. J. Hyg., 12: 537–568, November 1930) has reported the occurrence of spirochetes in the caeca of chickens.

was not obtained and, unfortunately, further observations were not possible at the time.

A strain of the spirochete was recently reestablished in eggs by Hughes with lyophilized yolk-sac material that had been stored for nearly 2 years at 40° F. Six eggs were inoculated. None of the embryos was dead by the seventh day. They were therefore sacrificed and their tissues examined. Spirochetes were not observed, but yolk-sac material from one egg was passed to six more eggs. Spirochetes were present in all eggs of this passage and of subsequent ones. At this time, another attempt was made to infect hens. Two 21-day-old chickens were injected intravenously with infected yolk-sac material. These chickens remained afebrile and appeared healthy. One was sacrificed on the twentieth day and brain-liver tissue suspension was used to inoculate six eggs. The embryos were dead on the seventh day, and spirochetes were found in the tissues of all the eggs. The second chicken was sacrificed on the twenty-sixth day and the same procedure was followed, with negative findings.

DISCUSSION

A natural suspicion would be that this spirochete is related to those causing fowl spirochetosis, *Borrelia anserina* (*Spirochaeta anserina*) or *Borrelia gallinarum* (*Spirochaeta gallinarum*) which most authorities now consider to be identical. The latter organisms, however, are described as being longer and more loosely curved than is the unknown spirochete, although these characteristics may be dependent upon the medium in which they are grown. The fact that the spirochete discussed here failed to produce discernible symptoms in inoculated chickens may indicate a difference from the known infectious agent of fowl spirochetosis. Whether or not it was in any measure responsible for the symptoms exhibited by the original hens is not known.

It is pertinent to add that although *Argas persicus*, the principal vector of fowl spirochetosis in many other countries, is quite prevalent in some parts of the United States, it does not occur locally. Lice were present in the three flocks but were not numerous and the species were not determined.

SUMMARY

The recovery of an unidentified spirochete, apparently from hens, but possibly also from hen's eggs, is reported. This is the first known evidence of the occurrence of a spirochete in the tissues of hens in the United States. This finding is of possible interest to laboratory workers because of the use of hen's eggs for the culture of various pathogens and for the manufacture of vaccines.

INCIDENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED FEBRUARY 8, 1947

Summary

A total of 3,624 cases of influenza was reported, as compared with 3,432 last week, the latter figure being the smallest weekly number reported this year. The 5-year (1942–46) median is 5,376. Decreases were reported in all of the nine geographic divisions except the West South Central and Mountain areas. The increase in these areas, as well as in the country as a whole, is accounted for chiefly in the increases in Texas, 2,013 (last week 1,519, next preceding week 2,280), Colorado, 144 (last week 48), and Arizona, 177 (last week 156). Virginia reported 371 cases (last week 430), and South Carolina 409 (last week 633). No State other than those named above reported more than 94 cases. The total for the year to date is 23,966, as compared with 139,368 for the same period last year and a 5-year median of 27,772.

Currently, 46 cases of poliomyelitis were reported as compared with 58 last week, 32 and 52, respectively, for the corresponding weeks of 1946 and 1945, and a 5-year median of 28. Since July 13, 1946, the weekly incidence has been continuously above that for every corresponding week of the past 18 years. The current incidence is above that for the corresponding weeks of those years except 1945. No State reported currently more than 4 cases, except California, which reported 15 cases (last week 8, next preceding week 18). The total for the year to date is 419, as compared with 280 for the corresponding period last year and a 5-year median of 192.

Of a total of 262 cases of amebic dysentery reported to date (last year 243), Texas has reported 57, Louisiana 42, Illinois 29; of 2,391 cases of bacillary dysentery (last year 2,019), Texas reported 2,254, South Carolina 55; and of 1,380 cases of unspecified dysentery (last year 778), Texas reported 915, Virginia 241, and Arizona 188. The 5-year (1942–46) medians are as follows: Amebic 129, bacillary 1,385, unspecified 320.

To date 539 cases of undulant fever have been reported, as compared with 392 and 433, respectively, for the corresponding periods of 1946 and 1945.

Deaths recorded for the week in 93 large cities in the United States totaled 9,664, as compared with 9,602 last week, 10,211 and 9,953, respectively, for the corresponding weeks of 1946 and 1945, and a 3-year (1944–46) median of 9,953. The total for the year to date is 60,031, as compared with 64,467 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended Feb. 8, 1947, and comparison with corresponding week of 1946 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none was reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946	
NEW ENGLAND												
Maine	3	1	0	------	24	------	378	11	13	0	2	3
New Hampshire	1	0	0	------	6	------	20	4	5	0	2	2
Vermont	2	0	0	12	6	2	133	2	3	0	1	0
Massachusetts	19	4	4	------	------	------	476	236	415	2	8	8
Rhode Island	0	0	0	1	------	2	75	2	59	0	3	3
Connecticut	0	0	0	1	11	8	286	47	169	0	2	5
MIDDLE ATLANTIC												
New York	27	29	14	[1] 4	[1] 15	[1] 14	142	2,475	1,272	14	15	26
New Jersey	1	4	4	6	14	14	71	284	284	5	6	9
Pennsylvania	23	14	9	6	2	3	545	1,337	1,337	3	16	16
EAST NORTH CENTRAL												
Ohio	21	31	13	6	27	16	503	77	126	4	7	7
Indiana	8	19	5	3	59	27	41	229	229	1	2	2
Illinois	7	5	12	------	7	9	26	1,073	323	4	9	9
Michigan [2]	2	19	4	------	4	4	92	988	215	2	2	7
Wisconsin	2	1	1	13	252	50	157	139	328	1	2	3
WEST NORTH CENTRAL												
Minnesota	7	25	4	------	2	1	32	7	28	1	1	1
Iowa	1	1	2	------	------	------	11	21	102	1	5	0
Missouri	2	8	6	2	16	6	7	334	158	2	4	6
North Dakota	1	0	0	2	5	5	1	------	------	1	0	1
South Dakota	0	2	4	------	------	------	9	53	53	0	1	0
Nebraska	3	1	1	22	1	2	9	18	18	0	0	0
Kansas	6	17	5	15	88	7	7	439	268	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	4	------	------	2	6	16	0	0	0
Maryland [2]	12	16	6	2	58	23	58	78	78	4	1	3
District of Columbia	0	0	0	2	4	3	10	25	25	0	1	1
Virginia	6	17	9	371	827	827	218	127	148	3	9	10
West Virginia	4	3	3	65	20	28	97	31	31	0	2	2
North Carolina	3	7	10	------	------	16	183	88	88	2	8	7
South Carolina	3	1	5	409	1,180	897	64	59	59	0	2	7
Georgia	9	4	8	26	75	152	188	4	131	4	2	2
Florida	4	9	5	5	3	3	13	3	29	1	0	4
EAST SOUTH CENTRAL												
Kentucky	5	5	6	1	6	9	1	259	48	4	12	5
Tennessee	6	11	7	26	57	63	88	51	55	2	4	6
Alabama	11	11	6	94	317	317	24	48	48	3	1	8
Mississippi [2]	5	6	4	------	------	------	------	------	------	2	4	4
WEST SOUTH CENTRAL												
Arkansas	2	6	7	62	260	260	74	112	113	3	2	3
Louisiana	0	5	8	1	1,279	23	------	60	60	0	5	5
Oklahoma	7	0	2	90	231	199	------	32	57	1	4	3
Texas	32	35	40	2,013	3,187	2,161	107	412	412	8	8	16
MOUNTAIN												
Montana	0	1	1	9	37	37	233	55	96	0	0	0
Idaho	0	3	0	13	113	2	7	71	37	0	0	0
Wyoming	0	1	0	------	4	18	4	24	56	0	0	1
Colorado	8	7	7	144	86	55	43	50	128	1	1	1
New Mexico	3	0	1	------	3	1	60	22	28	0	1	1
Arizona	3	2	2	177	164	155	48	7	18	0	1	0
Utah [2]	0	0	0	1	50	50	11	140	54	0	1	1
Nevada	0	0	0	------	------	------	------	3	6	0	0	0
PACIFIC												
Washington	4	9	3	1	------	------	40	504	153	1	2	3
Oregon	1	3	3	4	55	18	46	131	112	3	3	3
California	35	30	25	11	291	137	169	1,082	703	9	13	25
Total	299	373	305	3,624	8,846	5,376	4,809	11,260	12,803	92	175	244
6 weeks	1,878	2,489	2,057	23,966	139,368	27,772	[4] 24,060	39,542	62,348	516	1,295	1,416
Seasonal low week [3]	(27th) July 5–11			(30th) July 26–Aug. 1			(35th) Aug. 30–Sept. 5			(37th) Sept. 13–19		
Total since low	9,444	14,133	10,991	56,941	501,616	63,634	[4] 46,977	65,666	100,361	1,488	2,799	3,248

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Dates between which the approximate low week ends. The specific date will vary from year to year.
[4] Delayed report: Measles, West Virginia, 225 January cases, included in cumulative totals only.

Telegraphic morbidity reports from State health officers for the week ended Feb. 8, 1947, and comparison with corresponding week of 1946 and 5-year median.—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [4]		
	Week ended—		Median 1942–46	Week ended		Median 1942–46	Week ended—		Median 1942–46	Week ended—		Median 1942–46
	Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946		Feb. 8, 1947	Feb. 9, 1946	
NEW ENGLAND												
Maine	0	0	0	34	37	31	0	0	0	0	1	0
New Hampshire	1	0	0	7	8	9	0	0	0	0	0	0
Vermont	1	0	0	3	15	15	0	0	0	0	0	0
Massachusetts	0	0	0	168	179	373	0	0	0	0	0	0
Rhode Island	1	0	0	18	10	21	0	0	0	0	1	0
Connecticut	0	1	1	39	46	59	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	2	2	2	388	505	505	0	0	0	2	0	1
New Jersey	1	0	0	149	106	140	0	0	0	1	3	1
Pennsylvania	2	1	0	215	265	367	0	0	0	4	0	6
EAST NORTH CENTRAL												
Ohio	3	1	0	327	310	306	0	0	0	0	2	2
Indiana	0	0	0	85	114	114	0	1	1	0	1	1
Illinois	2	0	0	130	273	273	0	0	0	3	4	2
Michigan [3]	1	0	1	118	154	230	0	0	0	0	0	1
Wisconsin	0	1	1	68	138	208	0	0	0	2	1	1
WEST NORTH CENTRAL												
Minnesota	3	0	0	40	58	93	0	0	0	0	0	0
Iowa	0	0	0	60	47	75	0	0	0	1	0	0
Missouri	1	0	0	41	90	93	0	0	0	0	0	2
North Dakota	0	0	0	6	5	27	0	0	0	0	0	0
South Dakota	0	0	0	8	14	35	0	0	0	0	0	0
Nebraska	0	0	0	35	21	32	0	0	0	1	0	0
Kansas	1	0	0	34	91	95	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	0	12	5	8	0	0	0	0	1	0
Maryland [3]	0	1	0	27	51	88	0	0	0	0	0	0
District of Columbia	0	0	0	14	14	28	0	0	0	0	0	1
Virginia	0	0	0	31	66	66	0	0	0	2	1	1
West Virginia	0	1	1	30	32	37	0	0	0	0	1	1
North Carolina	1	1	0	44	49	48	0	0	0	2	2	1
South Carolina	0	0	0	3	6	6	0	0	0	1	0	0
Georgia	0	1	0	19	13	27	0	0	0	0	2	3
Florida	4	1	0	17	9	11	0	0	0	2	1	1
EAST SOUTH CENTRAL												
Kentucky	0	1	1	45	52	65	0	0	0	1	0	0
Tennessee	0	1	1	44	27	48	0	0	0	1	0	0
Alabama	3	0	1	15	8	22	0	1	0	0	0	1
Mississippi [3]	0	1	0	9	9	10	0	0	0	1	0	1
WEST SOUTH CENTRAL												
Arkansas	0	0	0	5	13	7	0	0	0	4	1	1
Louisiana	0	2	1	1	10	7	0	0	0	0	1	3
Oklahoma	1	0	0	7	24	26	0	0	0	1	0	1
Texas	2	4	1	41	56	62	0	2	2	2	4	4
MOUNTAIN												
Montana	0	1	0	1	6	28	0	0	0	0	0	0
Idaho	0	0	0	13	5	18	0	0	0	0	1	0
Wyoming	0	0	0	7	6	6	0	0	0	0	0	0
Colorado	0	0	0	49	48	48	0	0	0	1	0	0
New Mexico	0	0	0	8	26	8	0	0	0	0	0	0
Arizona	0	1	0	11	24	21	0	0	0	0	0	0
Utah [3]	0	0	0	24	14	63	0	0	0	0	0	0
Nevada	0	0	0	2	0	0	0	0	0	0	0	0
PACIFIC												
Washington	0	6	2	34	26	45	0	0	0	1	3	1
Oregon	1	0	0	26	24	24	0	0	0	1	1	0
California	15	4	4	134	215	215	0	0	0	1	2	2
Total	46	32	28	2,646	3,324	3,823	0	4	11	35	34	67
6 weeks	419	280	192	15,039	17,479	22,010	23	39	80	254	239	352
Seasonal low week [3]	(11th) Mar. 15–21			(32nd) Aug. 9–15			(35th) Aug. 30–Sept. 5			(11th) Mar. 15–21		
Total since low	25,193	13,617	12,258	41,725	56,050	60,953	77	115	197	3,782	4,490	5,456

[2] Period ended earlier than Saturday.
[3] Dates between which the approximate low week ends. The specific date will vary from year to year.
[4] Including paratyphoid fever reported separately, as follows: New Jersey 1.

Telegraphic morbidity reports from State health officers for the week ended Feb. 8, 1947, and comparison with corresponding week of 1946 and 5-year median—Con.

Division and State	Whooping cough			Week ended Feb. 8, 1947							
	Week ended—		Median 1942–46	Dysentery			Encephalitis, infectious	Rocky Mt. spotted fever	Tularemia	Typhus fever, endemic	Undulant fever
	Feb. 8, 1947	Feb. 9, 1946		Amebic	Bacillary	Unspecified					
NEW ENGLAND											
Maine	10	21	27								
New Hampshire		6	9								1
Vermont	21	24	28								3
Massachusetts	197	117	117								
Rhode Island	22	45	21								
Connecticut	50	37	52								3
MIDDLE ATLANTIC											
New York	200	214	278	7	3				1	1	10
New Jersey	145	103	103	1							1
Pennsylvania	152	141	148						1		8
EAST NORTH CENTRAL											
Ohio	176	90	183						1		5
Indiana	27	40	24			1	2		3		3
Illinois	128	100	100	9			1		12		8
Michigan [2]	142	88	106								3
Wisconsin	162	67	102				1				8
WEST NORTH CENTRAL											
Minnesota	4	4	31	1							
Iowa	11	5	15	3			1				10
Missouri	25	1	14			1					5
North Dakota			3								1
South Dakota	3		3								
Nebraska	19	3	4								1
Kansas	18	15	39								13
SOUTH ATLANTIC											
Delaware	10	7	1								
Maryland [2]	87	22	53			1					
District of Columbia	1	3	10						1		
Virginia	84	47	49			43			1	1	
West Virginia		10	38								
North Carolina	30	63	92						2		
South Carolina	37	42	45	2	3				2	1	
Georgia	7	6	14	2	3				1	10	
Florida	41	24	15			1				4	1
EAST SOUTH CENTRAL											
Kentucky	29	11	42				1				2
Tennessee	25	16	26				2		6	1	5
Alabama	20	20	15	5					1	8	2
Mississippi [2]									3	1	1
WEST SOUTH CENTRAL											
Arkansas	7	15	21		1				3		
Louisiana	6	3	3	23							
Oklahoma	5	9	10	1					2		2
Texas	474	87	181	14	220	54				10	11
MOUNTAIN											
Montana	4		21								1
Idaho	1	14	6								
Wyoming	1	2	3								
Colorado	12	12	35								2
New Mexico	10	2	6		1						
Arizona	34	11	29	1		12					1
Utah [2]		34	33								2
Nevada			1								
PACIFIC											
Washington	44	28	28	4		14	1				2
Oregon	16	18	18								
California	108	65	208	4			1			1	5
Total	2,605	1,692	2,304	77	231	127	10	0	40	38	120
Same week, 1946	1,692			45	271	86	3	0	8	41	71
Median, 1942–46	2,304			15	271	60	4	1	12	45	[4] 75
6 weeks: 1947	14,728			262	2,391	1,380	42	1	298	[3] 307	539
1946	10,925			243	2,019	778	45	1	130	337	392
Median, 1942–46	13,692			129	1,385	320	45	1	130	337	[4] 413

[2] Period ended earlier than Saturday.
[3] Correction: Typhus fever, Arkansas, week ended January 18, 2 cases (instead of 4).
[4] 2-year average, 1945–46.
Anthrax: Pennsylvania 1 case.

WEEKLY REPORTS FROM CITIES [1]

City reports for week ended Feb. 1, 1947

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENGLAND												
Maine:												
Portland	0	0	-----	0	31	1	4	0	2	0	0	2
New Hampshire:												
Concord	0	0	-----	0	-----	0	0	0	1	0	0	-----
Vermont:												
Barre	0	0	-----	0	4	0	0	0	0	0	0	9
Massachusetts:												
Boston	13	0	-----	0	20	0	9	0	18	0	0	62
Fall River	0	0	-----	0	4	0	0	0	4	0	0	5
Springfield	0	0	-----	0	7	0	0	0	2	0	0	19
Worcester	0	0	-----	0	3	0	14	0	3	0	0	21
Rhode Island:												
Providence	0	0	-----	0	36	0	3	0	5	0	0	7
Connecticut:												
Bridgeport	0	0	-----	0	16	0	0	0	0	0	0	2
New Haven	0	0	-----	0	46	0	2	0	9	0	0	2
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	-----	0	-----	0	2	0	7	0	0	3
New York	24	0	9	0	77	5	66	5	132	0	3	75
Rochester	0	0	-----	1	-----	1	1	0	15	0	0	3
Syracuse	4	0	-----	0	-----	1	1	0	21	0	0	16
New Jersey:												
Camden	0	0	-----	0	-----	0	1	0	3	0	0	9
Newark	0	0	2	1	5	2	5	0	20	0	0	32
Trenton	0	0	-----	0	18	0	3	0	6	0	1	6
Pennsylvania:												
Philadelphia	2	0	2	0	12	0	28	0	39	0	0	58
Pittsburgh	3	0	2	2	126	4	4	0	21	0	0	13
Reading	0	0	-----	0	-----	0	1	0	0	0	0	6
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	1	1	-----	2	4	0	7	0	0	12
Cleveland	1	0	1	0	258	1	8	0	26	0	0	20
Columbus	2	0	-----	0	-----	1	0	0	3	0	0	8
Indiana:												
Fort Wayne	0	0	-----	0	9	0	0	0	1	0	0	-----
Indianapolis	0	0	-----	2	2	1	4	0	12	0	0	12
South Bend	0	0	-----	0	-----	0	0	0	3	0	0	1
Terre Haute	0	0	-----	0	-----	0	2	0	1	0	0	-----
Illinois:												
Chicago	5	0	-----	0	19	4	31	1	60	0	0	75
Michigan:												
Detroit	2	0	-----	0	6	0	10	1	50	0	0	81
Flint	0	0	-----	0	-----	0	1	0	5	0	0	3
Grand Rapids	0	0	-----	0	2	0	0	0	1	0	0	4
Wisconsin:												
Kenosha	0	0	-----	0	-----	0	0	0	1	0	0	2
Milwaukee	0	0	-----	0	12	0	7	0	12	0	0	32
Racine	0	0	-----	0	-----	0	1	0	0	0	0	3
Superior	0	0	-----	0	-----	0	0	0	2	0	0	-----
WEST NORTH CENTRAL												
Minnesota												
Duluth	0	0	-----	0	-----	0	2	0	0	0	0	4
Minneapolis	0	0	-----	0	4	0	6	0	16	0	0	6
Missouri:												
Kansas City	1	0	-----	0	1	0	10	0	9	0	0	3
St. Joseph	0	0	-----	0	-----	0	0	0	1	0	0	-----
St. Louis	4	0	-----	0	2	0	8	0	13	0	0	6

[1] In some instances the figures include nonresident cases.

City reports for week ended Feb. 1, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	0	0	----	0	1	0	3	0	0	0	0	----
Kansas:												
Topeka	0	0	----	0	----	0	1	0	5	0	0	----
Wichita	0	0	----	0	1	0	4	0	2	0	0	2
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	----	0	----	0	0	0	5	0	0	8
Maryland:												
Baltimore	5	0	2	1	3	1	11	1	14	0	0	55
Cumberland	0	0	1	1	16	0	2	0	0	0	0	----
Frederick	0	0	----	0	----	0	0	0	0	0	0	----
District of Columbia:												
Washington	1	0	----	0	26	0	9	1	4	0	0	3
Virginia:												
Lynchburg	0	0	----	0	----	0	0	0	3	0	0	1
Richmond	1	0	----	0	30	0	5	0	5	0	0	5
Roanoke	0	0	----	0	4	0	0	0	9	0	0	1
West Virginia:												
Charleston	0	0	----	0	----	0	0	0	5	0	0	----
Wheeling	0	0	----	0	1	0	2	0	1	0	0	----
North Carolina:												
Wilmington	0	0	----	0	1	0	3	0	0	0	0	----
Winston Salem	0	0	----	0	28	0	1	0	4	0	0	1
South Carolina:												
Charleston	0	0	15	0	----	0	1	0	0	0	0	----
Georgia:												
Atlanta	0	0	2	1	35	0	4	0	10	0	0	1
Brunswick	0	0	----	0	----	0	1	0	0	0	0	----
Savannah	0	0	1	0	50	0	0	0	1	0	0	----
Florida:												
Tampa	0	0	3	0	----	0	5	0	4	0	0	----
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	3	0	1	1	----	0	10	0	2	0	0	4
Nashville	2	0	----	0	----	0	0	0	5	0	0	1
Alabama:												
Birmingham	1	0	11	2	----	0	1	0	1	0	0	----
Mobile	0	0	2	2	----	0	0	0	0	0	0	----
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	4	0	2	0	5	0	0	0	0	1
Louisiana:												
New Orleans	1	0	1	1	2	0	7	0	1	0	0	----
Shreveport	0	0	----	0	----	0	2	0	1	0	0	----
Texas:												
Dallas	1	0	1	1	2	0	2	0	3	0	0	5
Galveston	0	0	----	0	----	0	2	0	0	0	0	----
Houston	3	0	----	2	----	0	5	0	3	0	1	2
San Antonio	0	0	----	0	4	0	6	0	0	0	0	3
MOUNTAIN												
Montana:												
Billings	0	0	----	0	----	0	1	0	0	0	0	----
Great Falls	0	0	----	0	98	0	0	0	1	0	0	----
Helena	0	0	----	0	13	0	1	0	0	0	0	----
Missoula	0	0	----	0	----	0	1	0	0	0	0	----
Idaho:												
Boise	0	0	----	0	----	0	3	0	0	0	0	----
Colorado:												
Denver	1	0	4	1	15	0	10	0	31	0	0	2
Pueblo	0	0	----	0	----	0	4	0	3	0	0	----
Utah:												
Salt Lake City	0	0	----	0	5	0	2	0	7	0	0	----

City reports for week ended Feb. 1, 1947—Continued

Division, State, and City	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
PACIFIC												
Washington:												
Seattle	0	0	------	1	6	0	4	0	3	0	1	2
Spokane	0	0	------	0	11	0	3	1	2	0	0	1
Tacoma	0	0	------	0	------	0	0	0	3	0	0	3
California:												
Los Angeles	6	0	5	0	4	2	7	2	16	0	0	25
Sacramento	1	0	------	0	1	1	3	0	1	0	0	3
San Francisco	2	0	------	0	3	1	8	0	11	0	0	2
Total	91	0	70	21	1,082	28	377	12	697	0	6	753
Corresponding week, 1946	97	------	325	53	3,811	------	[3] 500	------	780	0	9	509
Average, 1942–46	77	------	357	[2] 68	[3] 3,296	------	[3] 496	------	[4] 1,356	0	12	713

[2] 3-year average, 1944–46.

[3] 5-year median, 1942–46.

Anthrax.—Cases: Philadelphia 1.
Dysentery, amebic.—Cases: New York 5; Philadelphia 1; Chicago 1.
Dysentery, bacillary.—Cases: Tampa 1; Los Angeles 3.
Dysentery, unspecified.—Cases: Baltimore 1; San Antonio, 2.
Tularemia.—Cases: Indianapolis 1; Nashville 1.
Typhus fever, endemic.—Cases: Baltimore 2; Tampa 3; Nashville 1; Mobile 2; New Orleans 1; Houston 1; Los Angeles 1.

Rates (annual basis) per 100,000 population, by geographic groups, for the 85 cities in the preceding table (estimated population, 1943, 33,796,100)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	37.2	0.0	0.0	0.0	478	2.9	91.6	0.0	126	0.0	0.0	369
Middle Atlantic	15.3	0.0	6.9	1.9	110	6.0	51.8	2.3	122	0.0	1.9	102
East North Central	7.4	0.0	1.2	1.8	189	5.5	41.7	1.2	113	0.0	0.0	155
West North Central	11.3	0.0	0.0	0.0	20	0.0	76.6	0.0	104	0.0	0.0	47
South Atlantic	11.6	0.0	39.8	5.0	321	1.7	72.9	3.3	108	0.0	0.0	124
East South Central	35.4	0.0	82.6	29.5	0	0.0	64.9	0.0	47	0.0	0.0	30
West South Central	14.3	0.0	17.2	11.5	29	0.0	83.2	0.0	23	0.0	2.9	32
Mountain	7.9	0.0	31.8	7.9	1,040	0.0	174.7	0.0	334	0.0	0.0	16
Pacific	14.2	0.0	7.9	1.6	40	6.3	39.5	4.7	57	0.0	1.6	57
Total	14.1	0.0	10.8	3.2	167	4.3	58.3	1.9	108	0.0	0.9	116

* * *

DEATHS DURING WEEK ENDED FEB. 1, 1947

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Feb. 1, 1947	Corresponding week, 1946
Data for 93 large cities of the United States:		
Total deaths	9,602	10,100
Median for 3 prior years	10,069	
Total deaths, first 5 weeks of year	50,367	54,256
Deaths under 1 year of age	810	586
Median for 3 prior years	602	
Deaths under 1 year of age, first 5 weeks of year	4,188	3,014
Data from industrial insurance companies:		
Policies in force	67,288,191	67,156,155
Number of death claims	13,746	16,146
Death claims per 1,000 policies in force, annual rate	10.7	12.7
Death claims per 1,000 policies, first 5 weeks of year, annual rate	9.9	11.9

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended January 18, 1947.—During the week ended January 18, 1947, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		21	1	292	577	44	37	83	132	1,187
Diphtheria		1		43	9	5		1		59
Dysentery, amebic					4					4
German measles				17	41		1	13	17	89
Influenza		23			5				2	30
Measles		178	3	109	72	147	203	290	444	1,446
Meningitis, meningococcus				1	2	1	4		1	9
Mumps		3		32	605	63	173	40	274	1,190
Poliomyelitis				1				1		2
Scarlet fever		2	3	133	106	5	1	2	7	259
Tuberculosis (all forms)		4	10	114	37	39	2		32	238
Typhoid and paratyphoid fever				14	1				2	17
Undulant fever					2				1	3
Venereal diseases:										
Gonorrhea		34	18	173	96	43	26	57	94	541
Syphilis	1	20	1	101	71	10	12	6	59	281
Other forms									2	2
Whooping cough		2		34	85	16	3	1	16	157

WORLD DISTRIBUTION OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From consular reports, international health organizations, medical officers of the Public Health Service and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases]

NOTE.—Since many of the figures in the following tables are from weekly reports, the accumulated totals are for approximate dates.

Place		January—November 1946	December 1946	January 1947—week ended—			
				4	11	18	25
ASIA							
Afghanistan	C	35					
Burma	C	1,462	81	1			
Bassein	C	29					
Moulmein	C	188	16				
Rangoon	C	23					
Ceylon	C	98	4				
China:							
Anhwei Province	C	2,749					
Chekiang Province	C	4,641					
Formosa, Island of	C	3,029					
Fukien Province	C	1,358					
Foochow	C	712					
Honan Province	C	1,654					
Hopeh Province	C	338					
Hunan Province	C	2,040					
Hupeh Province	C	359					
Ichang Province	C	147					
Kiangsi Province	C	1,594					
Kiangsu Province	C	[1] 9,221					
Shanghai	C	[1] 4,573					
Kwangsi Province	C	956					
Kwangtung Province	C	4,964					
Canton	C	2,002					
Hong Kong	C	505					

See footnote at end of table.

CHOLERA—Continued

Place		January–November 1946	December 1946	January 1947—week ended— 4	11	18	25
ASIA—continued							
China—Con.							
Kweichow Province	C	8					
Macao, Island of	C	2					
Shantung Province	C	21					
Szechwan Province	C	158					
Yunnan Province	C	17					
India	C	70,001	2,739				
Bombay	C	[2] 2					
Calcutta	C	1,877	48	12	31	39	
Cawnpore	C	45					
Chittagong	C	8					
Madras	C	5					
India (French)	C	4					
Indochina (French):							
Cambodia	C	432	76				
Cochinchina	C	867	38		30		
Bien Hoa	C	24					
Chaudok	C	21					
Mytho	C	144					
Rachgia	C	1					
Saigon-Cholon	C	58	30		15		
Vinh-long	C	7	8		4		
Laos	C	21	28				
Japan	C	1,204	25				
Korea (Chosen)	C	[3] 11,351					
Malay States	C	245					
Manchuria	C	18,554					
Mongolia	C	16					
Siam (Thailand)	C	3,871	508	65	168		
Bangkok	C	525	59	26	39		
Straits Settlements: **Singapore**	C	[2] 1					

[1] Includes imported cases.
[2] Imported.
[3] From the beginning of the outbreak in April or May to approximately Sept. 1, 1946.

PLAGUE

[C indicates cases; P, present]

AFRICA							
Algeria	C	2					
Bechuanaland	C	21					
Belgian Congo	C	[1] 30	3				
British East Africa:							
Kenya	C	38					
Uganda	C	12					
Egypt	C	217					
Alexandria	C	126					
Ismailiya	C	27					
Matariya	C	12					
Port Said	C	19					
Suez	C	32					
Libya: Tripolitania—Plague-infected rats		1					
Madagascar	C	211	16	1			1
Union of South Africa	C	5	2	1			
ASIA							
Burma	C	1,452	251	67	93		
Bassein	C	23					
Mandalay	C	1					
Rangoon	C	154					
China:							
Chekiang Province	C	722					
Formosa, Island of	C	11					
Fukien Province	C	4,371					
Amoy	C	307					
Foochow	C	1,401	2				
Kiangsi Province	C	268					
Kwangtung Province	C	415					
Yunnan Province	C	280					
India	C	17,625	4,080				

See footnote at end of table.

PLAGUE—Continued

Place		January–November 1946	December 1946	January 1947—week ended— 4	11	18	25
ASIA—continued							
Indochina (French): Cochinchna	C	48					
Java	C	38			2	4	
Manchuria	C	[2] 316					
Palestine	C	16	1		1		
Siam (Thailand)	C	38	3		1		
EUROPE							
Great Britain: Malta, Island of	C	6					
Portugal: Azores	C	[3] 15	8				
NORTH AMERICA							
Canada.[4]							
SOUTH AMERICA							
Argentina:							
Buenos Aires	C	8					
Cordoba Province	C	1					
Bolivia:							
Chuquisaca Department	C	1					
Santa Cruz Department	C	12					
Tarija Department—Plague-infected rats	P						
Brazil:							
Alagoas State	C	2					
Bahia State	C	32					
Ceara State	C	44					
Minas Geraes State	C		12				
Parahyba State	C	18					
Pernambuco State	C	35					
Ecuador:							
Chimborazo Province	C	2	5				
Loja Province	C	34	4				
Peru:							
Lambayeque Department	C	14	1				
Libertad Department	C		7				
Lima Department	C	20	6				
Piura Department	C	34	5				
Tumbes Department	C	1					
Plague-infected rats	P						
Venezuela	C	1					
OCEANIA							
Hawaii Territory:[5] Plague-infected rats		6	1				

[1] Includes 16 cases of pneumonic plague.
[2] Includes 52 cases of pneumonic plague.
[3] Includes 2 cases of pneumonic plague.
[4] The imported suspected case previously reported has not been confirmed. Under date of Sept. 14, 1946, plague infection was reported in a pool of fleas from squirrels in Alsask and in a pool of fleas from squirrels in Superb, Saskatchewan, Canada.
[5] Plague infection was also proved in Hawaii Territory as follows: On Feb. 5, 1946, in a pool of 29 rats; on Apr. 13, 1946, in a pool of 54 fleas and 15 lice recovered from 7 rats and 22 mice; under date of July 3, 1946, in a pool of 50 fleas recovered from 7 rats and 46 mice, and in a pool of 51 fleas recovered from 10 rats; under date of July 17, 1946, in a pool of 48 fleas recovered from 22 rats, and in a pool of 56 fleas recovered from 33 rats; under date of Sept. 12, 1946, in a pool of 48 fleas recovered from 22 rodents; under date of Oct. 9, 1946, in a pool of 36 rats found on Sept. 10, 1946; on Jan. 9, 1947, in a pool of 31 rats.

SMALLPOX

[C indicates cases; P, present]

AFRICA							
Algeria	C	258					
Angola	C	179					
Basutoland	C	46					
Bechuanaland	C	11					
Belgian Congo	C	[1] 3,368	[1] 115	[1] 15			
British East Africa:							
Kenya	C	858	35	3	6	11	
Nyasaland	C	717	26		23	44	9
Tanganyika	C	6,004	756				
Uganda	C	568	6	4			

See footnote at end of table.

SMALLPOX—Continued

Place		January–November 1946	December 1946	January 1947—week ended— 4	11	18	25
AFRICA—continued							
Cameroon (French)	C	90	6				
Dahomey	C	1,581	10		5		
Egypt	C	391	13	5	7		
Eritrea	C	23					
French Equatorial Africa	C	162					
French Guinea	C	935	5		1		
French West Africa: Dakar District	C	40					
Gambia	C	7					
Gold Coast	C	1,360	132	59			
Ivory Coast	C	1,465	186		[3] 65		
Liberia	C	190	47				
Libya	C	708	215	74	92		90
Madagascar	C	1					
Mauritania	C	1					
Morocco (French)	C	1,875	15			[3] 19	
Morocco (Int. Zone)	C	178					
Morocco (Spanish)	C	5					
Mozambique	C	4					
Nigeria	C	6,157					
Niger Territory	C	529	34		[3] 28		
Rhodesia:							
Northern	C	424	12				
Southern	C	148					1
Senegal	C	95					
Sierra Leone	C	452					
Somaliland (Italian)	C	1					
Sudan (Anglo-Egyptian)	C	56					
Sudan (French)	C	1,987	54		[3] 13		
Swaziland	C	1	1				
Togo (French)	C	294	67		[3] 13		
Tunisia	C	376					
Union of South Africa	C	674	P		P	P	
ASIA							
Arabia	C	2					
Burma	C	1,835	120	50	39		
Ceylon	C	531	1				
China	C	2,057	630	126	62	76	40
India	C	58,638	1,815				
India (French)	C	3					
India (Portuguese)	C	19					
Indochina (French)	C	2,160	223		29	33	
Iran	C	31				1	
Iraq	C	22					
Japan	C	17,722	78	19	12		
Malay States	C	2,319	654	231	314	265	
Palestine	C	[4] 2					
Rhodes, Island of	C	[4] 1					
Siam (Thailand)	C	17,691	84	68	77		
Straits Settlements	C	177	27	22	6	11	5
Syria and Lebanon	C	8	1				
Turkey (see Turkey in Europe).							
EUROPE							
Czechoslovakia	C	24					
France	C	16					
Germany	C	1					
Gibraltar	C	[4] 3					
Great Britain:							
England and Wales	C	[5] 53					
Malta, Island of	C	10					
Scotland	C	2					
Greece	C	114					
Italy	C	627					
Portugal	C	57	1		1	1	
Spain	C	8					
Turkey	C	17					
Yugoslavia	C	1					
NORTH AMERICA							
Canada	C	2					
Guatemala	C	55	1				
Honduras	C	4					
Mexico	C	396					
Nicaragua	C	3					

See footnotes at end of table.

SMALLPOX—Continued

Place		January–November 1946	December 1946	January 1947—week ended— 4	11	18	25
SOUTH AMERICA							
Argentina	C	69					
Bolivia	C	874	44				
Brazil	C	[1] 305	[1] 5	2			
Colombia	C	1,014	55		2		
Ecuador	C	82	38				
Paraguay	C	[1] 371					
Peru	C	506					
Uruguay	C	40					
Venezuela	C	[1] 1,745	[1] 26		[1] 50		
OCEANA							
Hawaii Territory	C	[6] 1					

[1] Includes alastrim.
[2] For the period Jan. 1–10, 1947.
[3] For the period Jan. 1–20, 1947.
[4] Imported.
[5] Includes imported cases.
[6] Off-shipping.

TYPHUS FEVER*

[C indicates cases; P, present]

AFRICA							
Algeria	C	783					
Basutoland	C	7	3				
Belgian Congo [1]	C	2,557	10	17			
British East Africa:							
Kenya	C	27					
Uganda	C		1				
Egypt	C	1,393	14	3			
Eritrea	C	1,324	62	53		27	
French West Africa: Dakar District	C	7					
Libya	C	88					
Madagascar [2]	C	1					
Morocco (French)	C	3,744	42				
Morocco (Int. Zone)	C	53					
Morocco (Spanish)	C	25					
Nigeria	C	34					
Rhodesia, Northern	C	1					
Sierra Leone [1]	C	6					
Tunisia [1]	C	280					
Union of South Africa [1]	C	510	P		P	P	
ASIA							
Arabia [3]	C	2					
Burma [1]	C	3	1				
China [1]	C	381	4				
India	C	299	1				
Indochina (French)	C	61	9				
Iran	C	149					
Iraq	C	205	14	6	4	1	2
Japan	C	30,907	234	39	70		
Malay States	C	3					
Manchuria	C	89	1				
Palestine [1]	C	92					
Philippine Islands [1]	C	4					
Straits Settlements	C	2	1	1			
Syria and Lebanon	C	86					
Trans-Jordan	C	21					
Turkey. (See Turkey in Europe.)							
EUROPE							
Albania	C	121					
Austria	C	35					
Belgium [1]	C	14					
Bulgaria	C	1,033	87	27	39		
Czechoslovakia [1]	C	788	11				
France [1]	C	16				2	
Germany	C	1,869	3				
Gibraltar [3]	C	1					
Great Britain:							
England and Wales	C	1					
Malta and Gozo [1]	C	31					
Greece [1]	C	384	47	13	3	9	
Hungary	C	1,046	60	23	17	16	

See footnotes at end of table.

TYPHUS FEVER*—Continued

Place		January–November 1946	December 1946	January 1947—week ended— 4	11	18	25
EUROPE—continued							
Italy	C	25					
Netherlands [1]	C	24	1				
Poland	C	3,357	39	5			
Portugal	C	12	2			1	
Rumania	C	9,747	503	279			
Spain	C	28					
Canary Islands	C	2					
Sweden [2]	C	1					
Switzerland [1]	C	2					
Turkey	C	1,325	87	23	18	29	
Union of Soviet Socialist Republics: Ukraine	C	P					
Yugoslavia	C	2,971					
NORTH AMERICA							
Costa Rica [2]	C	77	6				3
Cuba [2]	C	20	1				
Guatemala	C	755	24				
Jamaica [2]	C	38	3				
Mexico	C	1,729					
Panama Canal Zone	C	1					
Panama (Republic)	C	4					
Puerto Rico [2]	C	101	4	2			
Salvador	C	1					
Virgin Islands [2]	C	3					
SOUTH AMERICA							
Argentina	C	7					
Bolivia	C	249	7				
Brazil [1]	C	16	1				
Chile	C	547					
Colombia	C	685	288				
Curacao [2]	C	1					
Ecuador [1]	C	1,012	84				
Paraguay	C	1					
Peru	C	1,023					
Venezuela [1]	C	101	3				
OCEANIA							
Australia [2]	C	147	3	1	1		
Hawaii Territory [2]	C	86	3	1	2	1	

* Reports from some areas are probably murine type, while others probably include both murine and louse-borne types.

[1] Includes cases of murine type.

[2] Murine type.

YELLOW FEVER

[C indicates cases, D, deaths]

AFRICA							
French Equatorial Africa: Carnot	C	[1] 3	[2] 5				
Ivory Coast: Seguela	C	1					
Nigeria:							
Ibadan	C	1					
Ilorin	C	1					
Kafanchan	C	2					
Ogbomosho	C	41					
Sierra Leone: Pujehan	C	1					
SOUTH AMERICA							
Bolivia: Santa Cruz Department	D	[3] 40					
Brazil: Para State	D	1					
Colombia:							
Antioquia Department	D	1					
Caqueta Territory	D	2					
Magdalena Department	D	1					
Santander Department	D	13	3		1		
Peru: San Martin Department	D	3					
Venezuela:							
Tachira State	C	4					
Trujillo State	C	4					
Zulia State	C	4					

[1] Includes 2 suspected cases. [2] Diagnosis confirmed in 4 cases.

[3] Diagnosis confirmed in 14 cases and 10 deaths.

FEDERAL SECURITY AGENCY

UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF PUBLIC HEALTH METHODS

G. ST. J. PERROTT, *Chief of Division*

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